Feb. 17, 1953 K. A. WRIGHT 2,628,682

CENTERING AND WELL CLEANING TOOL

Filed Sept. 23, 1947 2 SHEETS--SHEET 1

Fig. 1.

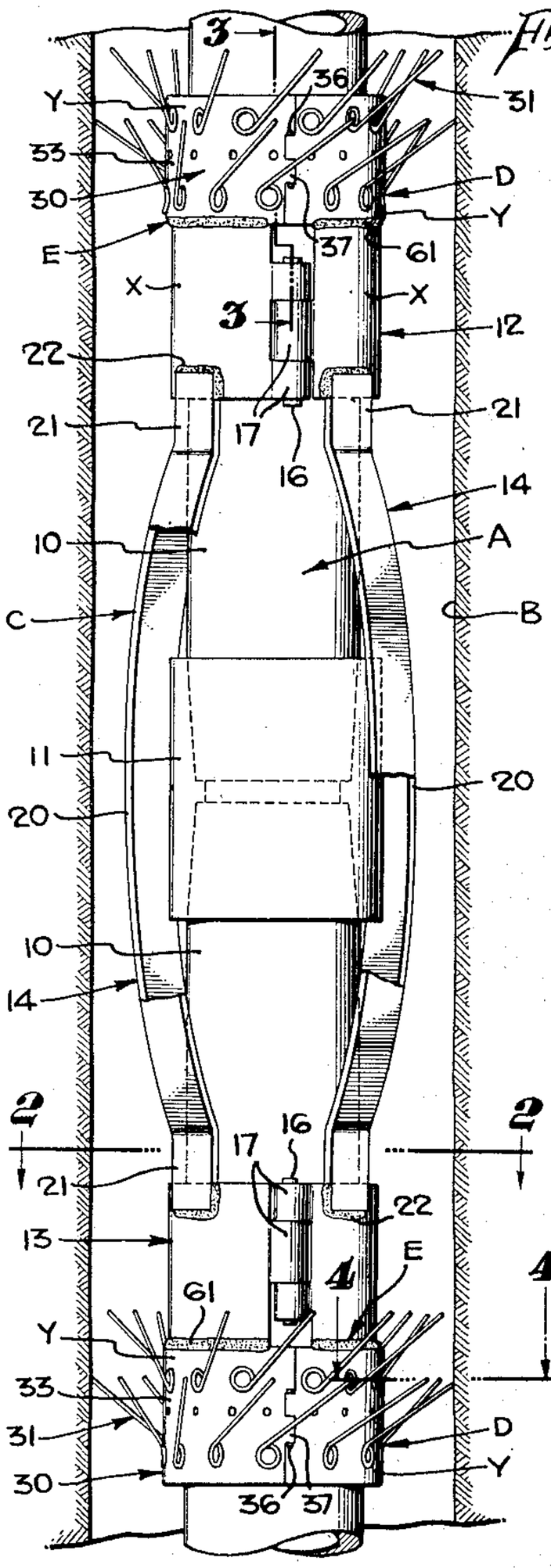

Fig. 3.

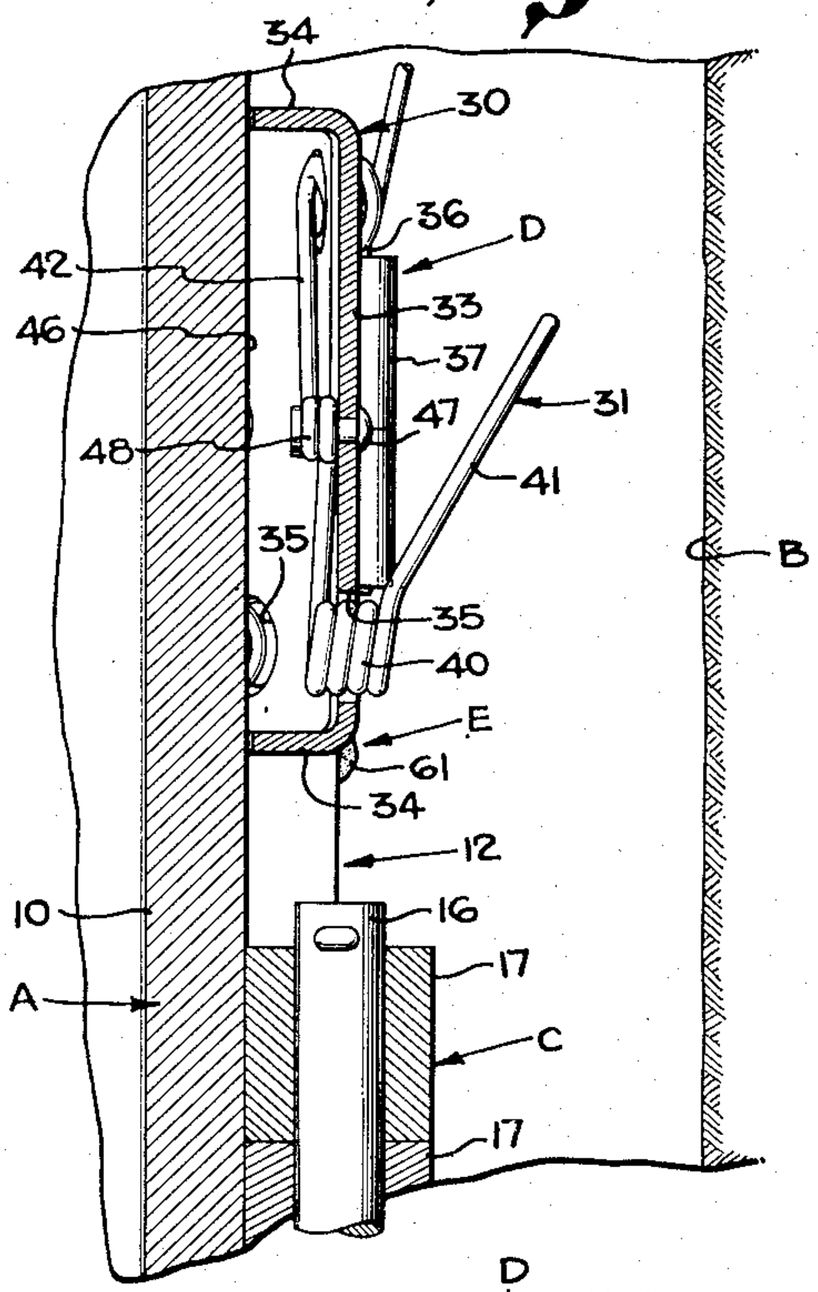

Fig. 5.

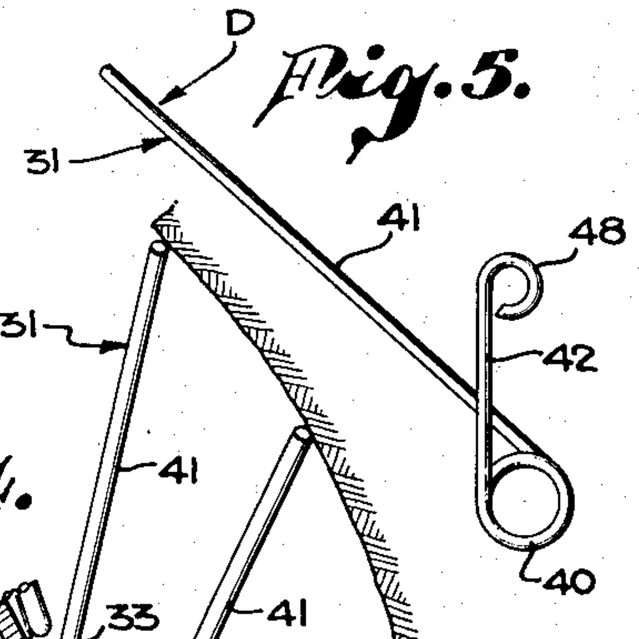

Fig. 4.

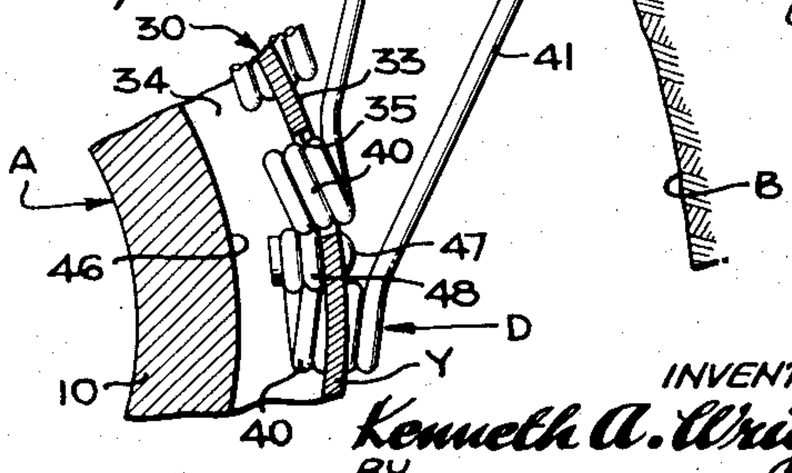

Fig. 2.

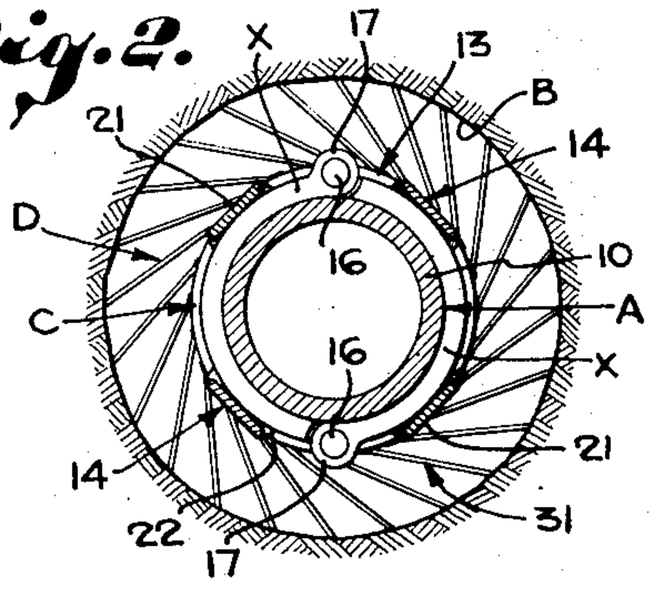

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Fig. 6.

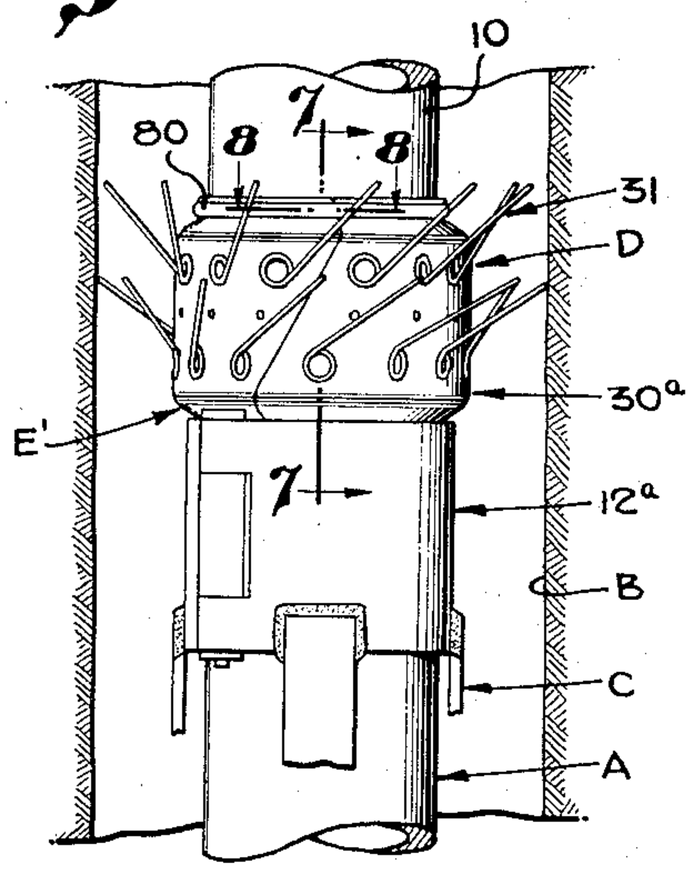


Fig. 7.

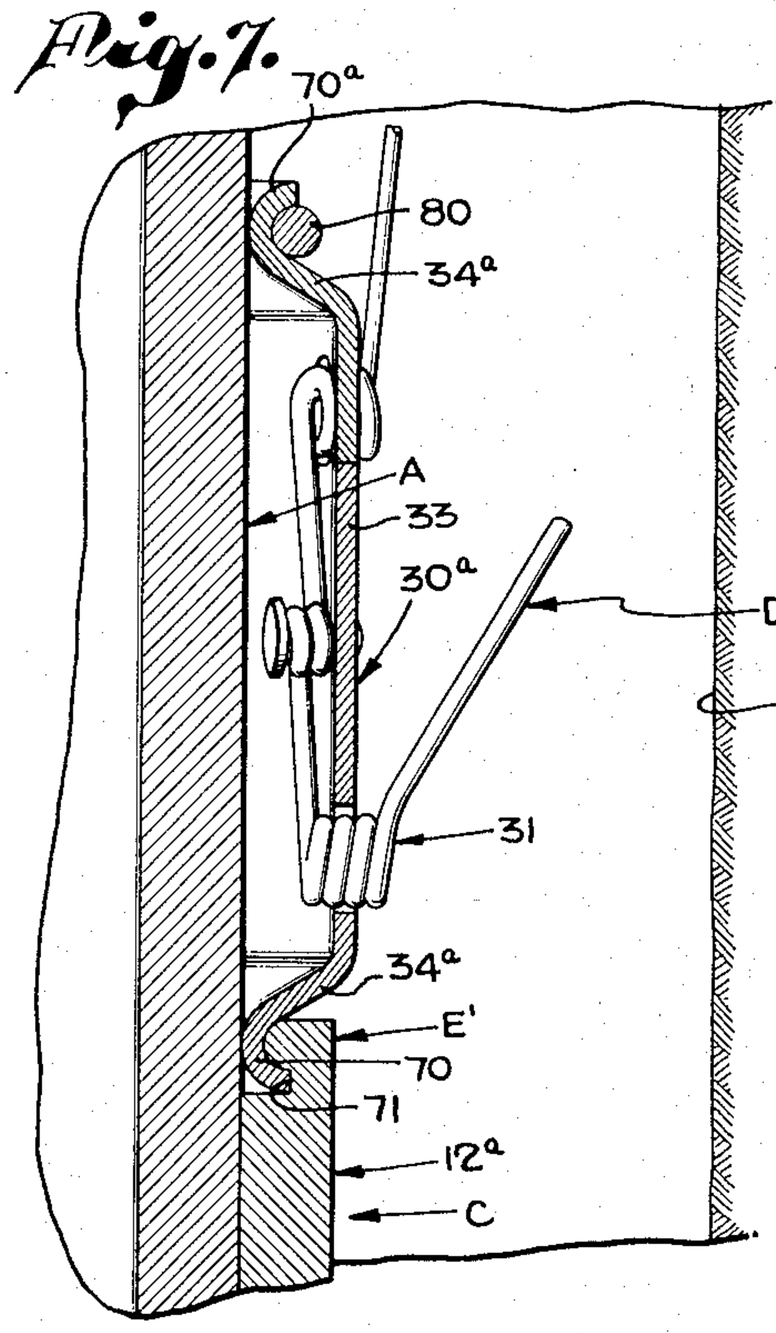


Fig. 8.

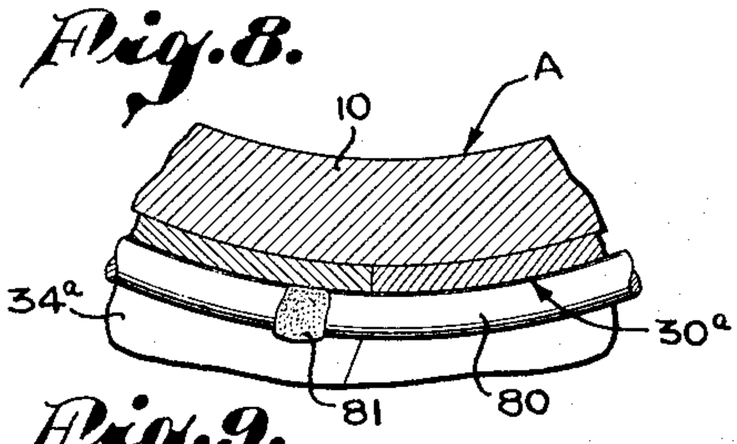


Fig. 9.

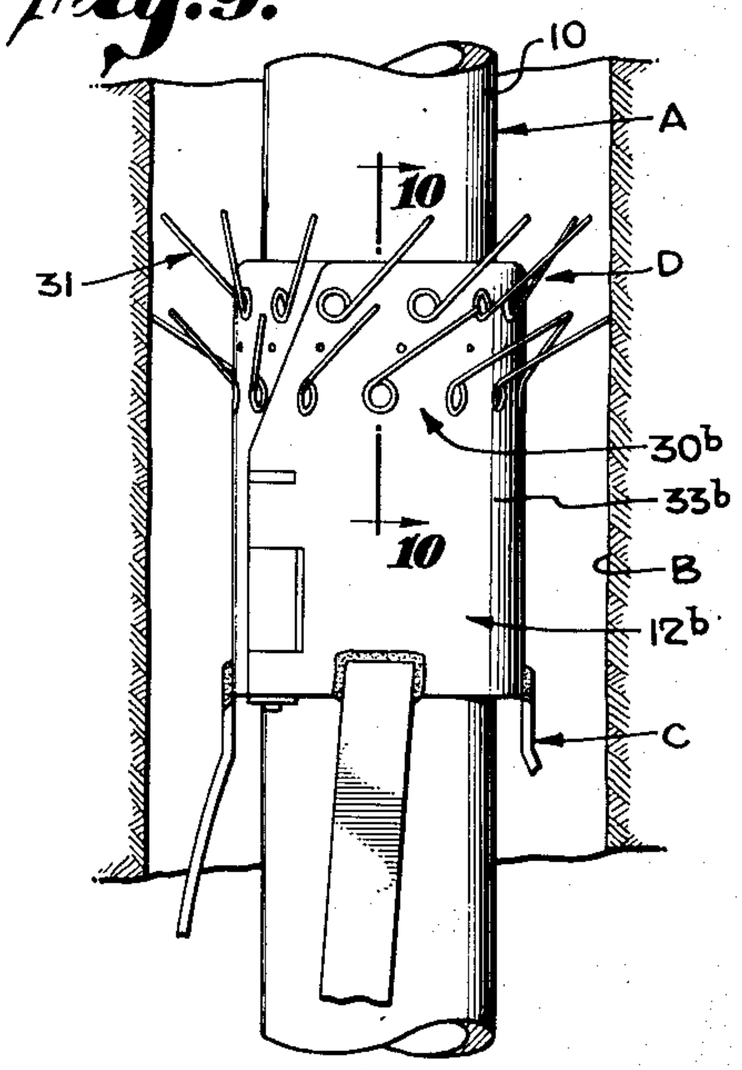
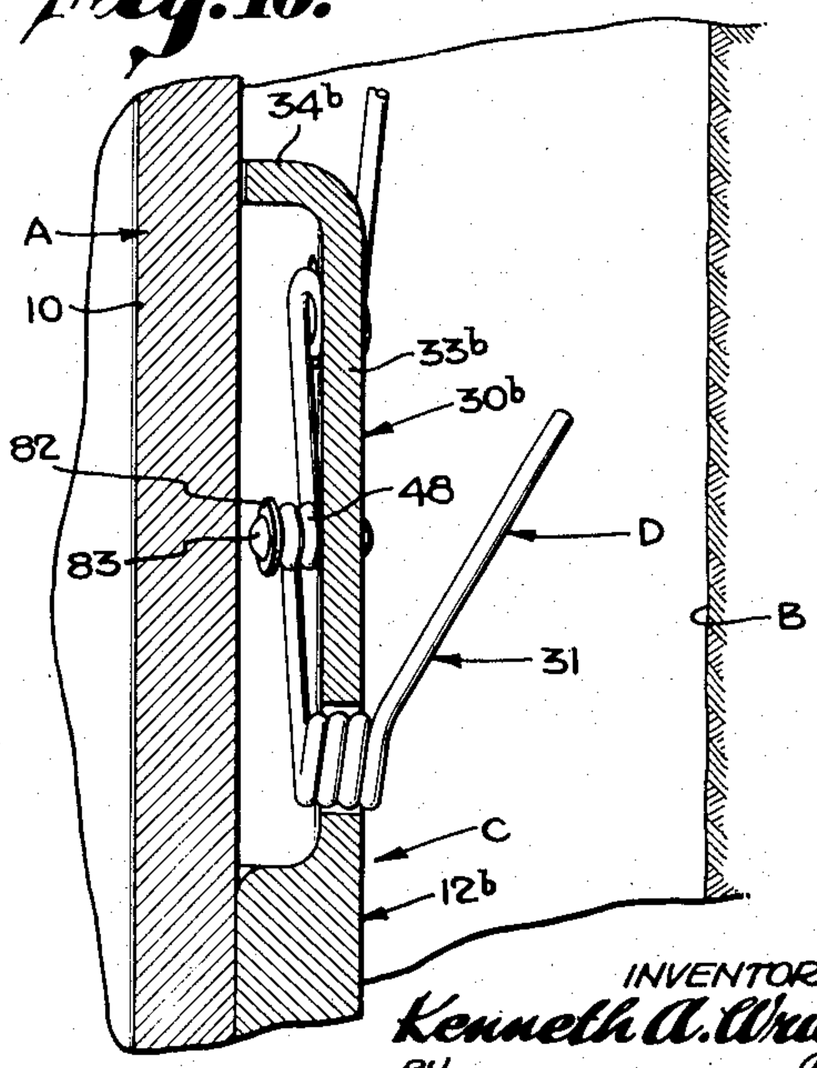


Fig. 10.



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Patented Feb. 17, 1953 2,628,682

UNITED STATES PATENT OFFICE

2,628,682

CENTERING AND WELL CLEANING TOOL

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Application September 23, 1947, Serial No. 775,641

2 Claims. (Cl. 166—18)

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This invention relates to a centering and well cleaning tool, it being a general object of the invention to provide a tool of this general character incorporating advantageous guiding and centering features in a simple, compact, unitary and practical structure.

When it is desired to cement an object such as a casing in a well bore it is highly desirable to remove mud, filter cake, or loose material from the wall of the bore to provide a satisfactory foundation for the cement and as the cement sets it is desirable to hold or maintain the casing centralized in the well.

A general object of the present invention is to provide a construction combining a sturdy dependable centralizer construction with a satisfactory wall cleaner so that the cleaner which is of light, more or less frail construction in no way impairs or interferes with the centralizer which is preferably of sturdy unfailing construction.

Another object of the invention is to provide a structure of the character referred to in which the guide and cleaner are related so that the tool is contractible to a very small diameter, if necessary, in fact to a size no greater than can be attained with a conventional centralizer construction.

A further object of the invention is to provide structure of the character referred to in which the centralizer or cleaners are arranged in tandem or end to end lengthwise of the pipe, while the centralizer serves as a mounting or carrier for the cleaners. With my present construction it is unnecessary to attempt to establish a satisfactory joinder of the lightly constructed cleaners to the well casing, since the connection of the cleaners to the ends of the centralizer is secure and dependable and can, if desired, be done in a position or at a point remote from the casing where conditions are favorable to satisfactory manufacture.

Another object of the invention is to provide a structure of the general character referred to in which the cleaners are detachable from or releasably held by the centralizer making it possible for the operator to use the cleaners at will and further making it possible to readily vary the size, shape, or character of the cleaners used in connection with a particular centralizer as circumstances may require.

The various objects and features of my invention will be fully understood from the following detailed description of typical preferred forms and applications of the invention, throughout

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which description reference is made to the accompanying drawings, in which:

Fig. 1 is a view with certain parts broken away illustrating a typical form and application of the present invention showing the centralizer equipped at each end with cleaners, the centralizer being applied to a typical well casing and the assembly being indicated in a well bore. Fig. 2 is a plan section taken as indicated by line 2—2 on Fig. 1. Fig. 3 is an enlarged longitudinal sectional view taken as indicated by line 3—3 on Fig. 1. Fig. 4 is a plan section taken substantially as indicated by line 4—4 on Fig. 1. Fig. 5 is a view of a part of one of the cleaners that I have provided showing it removed from the other parts of the structure. Fig. 6 is a view of a portion of a modified construction, being a view similar to the upper portion of Fig. 1, showing a structure somewhat different than that shown in Fig. 1. Fig. 7 is a view similar to Fig. 3 showing the construction illustrated in Fig. 6, being an enlarged view taken as indicated by line 7—7 on Fig. 6. Fig. 8 is an enlarged plan section taken as indicated by line 8—8 on Fig. 6. Fig. 9 is a view similar to Fig. 6 of a further modified form of construction, and Fig. 10 is a view similar to Fig. 7 showing the construction illustrated in Fig. 8, being an enlarged view taken as indicated by line 10—10 on Fig. 9.

The structure of the present invention is particularly applicable to a well casing, or the like, to be used in the course of cementing such casing in a well bore and it serves to dislodge mud, filter cake or loose formation from the walls of the well bore and to maintain the casing central in the bore as cement is applied and subsequently sets. In the drawings I have shown a typical application of the invention to a well casing A shown located in a well bore B. The particular casing A shown in the drawings involves tubular sections 10 joined by couplings 11 in the manner common to well casings, and the structure of the present invention is shown applied to a casing at a coupling 11 to embrace or straddle the coupling or other stop or shoulder affixed to or carried by the casing with the result that the stop serves as a means of maintaining the structure in the desired position lengthwise of the casing.

The structure of the present invention includes what may be termed a centralizer C and one or more scratcher devices or cleaners D combined with or related to the centralizer. Ordinarily in practice it is desirable to provide two cleaners

D in connection with a single centralizer C and to arrange the cleaners in tandem with the centralizer at the ends thereof, in which case I provide means E coupling the cleaners with the centralizer.

The centralizer C employed in carrying out the invention may vary widely in form and construction, it being preferred, however, that it be of somewhat conventional form including upper and lower collars **12** and **13** with a plurality of spacers **14** of flexible resilient material such as spring steel extending between the collars. In the preferred construction shown in the drawings each collar of the centralizer is of sectional construction enabling the centralizer to be assembled around a casing rather than being slid lengthwise over the end thereof. In the drawings I have shown each collar as involving two semi-circular sections *x* joined by suitable coupling pins **16**, the collar sections having meshing or overlapping parts **17** which are engaged and connected by the pins **16**.

The spacers **14** of the centralizers are elongate members preferably in the nature of leaf springs extending lengthwise of the structure and circumferentially spaced substantially as shown throughout the drawings. Each spacer is shown as having a middle bearing portion **20** and end parts **21** which engage and are joined to the collars **12** and **13**. In the case illustrated the ends of the spacers are permanently joined to the collars as by welding **22** so that they extend in a direction parallel with casing A. I may if I so desire pitch the spacers in a manner such as is shown in Fig. 9 so that they spiral about the casing A.

In accordance with the preferred application of the centralizer C the upper collar **12** is arranged above the coupling or stop **11** of the casing, while the lower collar **13** is arranged below the coupling **11**. With this arrangement the coupling **11** serves to locate the centralizer on the casing allowing but limited movement of the structure lengthwise of the casing. In cases where it is desirable to employ more centralizers C than there are couplings **11**, or where centralizers are required to be closer together than are the couplings, I may provide suitable collars or stops of any suitable form in addition to or in place of the collars and the stops may be spaced along the casing as desired. The coupling shown in the drawings is a stop and may be considered both as a coupling and a stop since it serves both functions.

Referring specifically to the form and application of the invention shown in Figs. 1 to 5, inclusive, there is a scratcher device or cleaner D at each end of the centralizer and the cleaners are arranged tandem to the centralizer so that there is a cleaner immediately adjacent and projecting from the outer end of each centralizer collar.

The particular cleaner shown in Figs. 1 to 5 includes, generally, an annular body **30** surrounding the casing A and a plurality of scratcher fingers **31** carried by each body and projecting therefrom in a manner to effectively engage and act upon the wall of the well bore B. In accordance with my invention each cleaner body is free of the casing A, that is, is related to the casing so that it is not joined or fixed thereto but rather is attached to the centralizer through the means E.

The particular cleaner body **30** under consideration includes, generally, a tubular main portion **33** preferably a thin-walled member somewhat larger in diameter than the casing A, and inwardly projecting end flanges **34** at the ends of the main portion **33** projecting inwardly toward and preferably closely approaching the casing A. In the preferred construction the flanges **34** are integral with the part **33**. The main tubular part **33** of the cleaner is provided with a plurality of openings **35** that pass or accommodate the fingers **31**, and in the preferred arrangement where the fingers are in two rows around the cleaner, one close to each end flange **34**, there are two rows of openings **35**.

In the preferred construction shown in the drawings each body **30** is of sectional construction enabling the body to be assembled around a casing. In the drawings I have shown each body **30** as involving two semi-circular sections *y* joined by suitable coupling pins **36**, the body sections having meshing or overlapping parts **37** which are engaged and connected by the pins.

Each finger is shown as including a base portion **40**, a projecting tip portion **41**, and an anchor portion or tail part **42**. The base portion **40** is preferably coiled or spirally formed as illustrated in the drawings and occupies or extends through an opening **35** to enter a chamber **46** established between the body portion **33** and the exterior of the casing A. In practice the base **40** may vary in size or diameter depending upon the size of the opening **35**, and it may vary in length depending upon the depth of the chamber **46** or upon the amount of base that may be allowed to project beyond the exterior of the body part **33**.

The tip **41** of the finger may be a straight or substantially straight elongate part joined to and continuing from the base **40**. In the case illustrated the tip is the outer end portion of the wire out of which the finger is formed and it extends radially outward and at the same time circumferentially and somewhat axially of the cleaner, as clearly illustrated throughout the drawings. With this disposition of the tip **41** the cleaner can be readily lowered through a well bore and the cleaner can be rotated in a clockwise direction without danger of over-stressing or deforming the fingers. If the cleaner is moved in a counter-clockwise direction or is moved upwardly the fingers have a marked tendency to be deflected outwardly giving the cleaner a wide range of action.

The anchor or tail part **42** of the finger is located entirely within the chamber **46** and may be held by or anchored to a suitable fixed part such as a projection **47** located in the chamber **46**. The tail parts **42** of two fingers, one in the upper row of fingers and one in the lower row of fingers may be fixed to a common projection **47**, as shown in Fig. 3, by looped parts **48** formed at or on the ends of the tail parts **42** engaged around the projection. The projections **47** extend inwardly from the body part **33** and have heads retaining the looped parts in position thereon. The fingers **31** occurring adjacent the joint established between the sections *y* may be individually anchored by single projections each engaged by but one looped part **48** as shown in Figs. 1 and 3 of the drawings.

In the preferred relationship of parts the base **40** fits the opening **35** with substantial clearance and the chamber **46** is such as to allow for considerable movement of the base portion and tail parts therein, if necessary. In the particular case under consideration the body of the cleaner is, in effect, a continuous annular element formed

of the semi-circular sections *y* joined by the pins **37**.

The means E provided to couple the cleaner with the collar of the centralizer is in the form of the invention under consideration a permanent means involving welding permanently joining the body section *y* of the cleaner to the collar section *x* at the outer end portions thereof. I prefer to join or relate each collar section *x* and its attached body section *y* so that they form a unit that can be readily applied to a casing **10**. In the arrangement shown each collar section *x* has a body section *y* joined thereto by welding **61** so that the pins **16** and **37** are in alignment. With this arrangement the pins at one side of this structure may be initially installed assembling the entire structure into a unit that can be easily handled and which can be hinged or folded around the casing **10** to be made fast by application of the pins **16** and **37** at the other side of the structure. It is to be observed that in the case illustrated the body of the cleaner is of substantially the same outside diameter as the collar of the centralizer to which it is connected, being shown as but slightly larger than the collar, it being apparent that with the construction that I have provided these parts may be made to correspond in diameter, if it is so desired. Through the relationship of parts above described the body sections may be joined to the collar sections after which they may be assembled around the casing A.

In the form of the invention illustrated in Figs. 6, 7 and 8 of the drawings the body **30**[a] of the cleaner is detachably joined to the collar such as collar **12**[a] of the centralizer through means E'. In this form of the invention the main tubular portion of the cleaner body may be a straight simple tubular element as hereinabove described, and the fingers **31** may correspond to those hereinabove described. The end flanges **34**[a] of the cleaner body are shown somewhat biased or inclined instead of being straight inwardly projecting.

The means E' is shown as including a curved lip **70** projecting from the inner edge portion of the flange **34**[a] adjacent the collar **12**[a] which lip is seated or engaged in an undercut channel or recess **71** in the end portion of the centralizer collar. When employing the releasable connecting or coupling means E' just described it is advantageous that the body **30**[a] of the cleaner be sectional, that is, that it be formed in semi-circular sections that can be easily assembled around a casing A, it being unnecesary that the body sections be joined by welding or other permanent connecting means. When the collar **12**[a] of the centralizer is assembled around the casing A with the lip **70** engaged in the recess **71** the body of the cleaner is effectively coupled to the collar so that it cannot become detached therefrom. In practice it is desirable in such case to provide a means for securing the body sections of the cleaner together at the outer or projecting end of the cleaner. In the case illustrated a curved lip **70**[a] is shown projecting from the outer flange **34**[a] of the cleaner body and a retainer band **80** is shown engaged in the lip **70**[a] and extending around the body of the cleaner positively preventing separation of the body sections at the outer end portion thereof. The ring or retainer band **80** may be a simple annular rod or heavy wire with its ends joined as by welding **81**.

In the form of the invention illustrated in Figs. 9 and 10 of the drawings the body **30**[b] of the cleaner is shown as an integral extension of the collar **12**[b], in which case the body of the cleaner may comprise merely the tubular body portion **33**[b] and an outer end flange **34**[b]. In this case the fingers **31** may be of the same formation hereinabove described and they may be carried by and related to the body of the cleaner in the manner described above. The projections that hold the looped ends **40** of the fingers are shown as rivets **83** with washers **82** under the heads of the rivets engaging the looped ends. It is to be observed that in this form of the invention the exterior of body **30**[b] is of the same diameter and is continuous with the exterior of the collar of the centralizer.

From the foregoing description it will be apparent that I have, by my present invention, provided a structure combining an effective centralizer construction and an advantageous cleaner construction in a most compact, simple and practical manner, arranging the cleaner or cleaners at the ends of the centralizer and without complicating in any way the construction, formation, or operation of the centralizer. As will be apparent from Figs. 1 to 10 of the drawings the invention may be carried out so that the cleaners are separately formed or independently constructed units which are incorporated with the centralizer, if desired. It is also to be observed that with my construction the ordinary or conventional type of cleaner construction is advantageously mounted without being joined directly to the casing, the coupling or other stop between the cleaner and the centralizer serving as the sole mounting means for the cleaner.

Having described only typical preferred forms and applications of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims.

Having described my invention, I claim:

1. A well tool adapted for lateral application to a well casing to be lowered into a well bore, the casing having a stop element thereon, comprising in combination: a pair of axially spaced collars, each collar including substantially semi-circular sections connected by diametrically positioned axially extending hinge pins, a plurality of circumferentially spaced bowed spacers having their ends fixed to said collars, said bowed spacers being shaped to span the stop element on the casing and to contact the wall of the well bore for centering the casing therein, a scratcher device secured to at least one of the spaced collars, the scratcher device including a pair of semi-circular elements cooperating to encircle the casing, the joints between the elements being aligned with said hinge pins, weld means connecting each of the semi-circular elements with one of said collar sections, and scratcher fingers on said elements extending outwardly to engage the wall of the well bore.

2. A well tool adapted for lateral application to a well casing to be lowered into a well bore, comprising in combination: a pair of axially spaced collars, each collar including substantially semi-circular sections connected by diametrically positioned axially extending hinge pins, a plurality of circumferentially spaced bowed spacers having their ends fixed to said collars, said bowed spacers being shaped to contact the wall of the well bore for centering the

casing therein, a scratcher device secured to each of the spaced collars, each scratcher device comprising a pair of semi-circular elements, each element being fixed to one of the collar sections, the joints between the elements being aligned with said hinge pins, weld means connecting each of the semi-circular elements with one of said collar sections, and scratcher fingers on said elements extending outwardly to engage the wall of the well bore.

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